Claims

1. A process for dehydrogenating a hydrocarbon selected from at least one of:

i) paraffinic hydrocarbons, and

ii) alkylaromatic hydrocarbons;

comprising contacting a gaseous stream containing at least one of the hydrocarbons with a dehydrogenation catalyst at reaction temperature and in concurrent flow through a dehydrogenation reactor wherein the average contact time between the hydrocarbon and catalyst within the dehydrogenation reactor is from about 0.5 to about 10 seconds.

2. A process of claim 1 wherein the catalyst has an average residence time within the dehydrogenation reactor from about 0.5 to about 40 seconds.

3. A process of claim 2 wherein the hydrocarbon and catalyst are transferred from the dehydrogenation reactor to a separation device wherein the average contact time between the hydrocarbon and catalyst while at reaction temperature in the separation device is less than about 10 seconds.

4. A process of claim 3 wherein the total average contact time between the hydrocarbon, catalyst and resulting hydrocarbons while at reaction temperature is less than about 20 seconds.

5. A process of claim 4 wherein the total average contact time is less than about 10 seconds.

6. A process of claim 1 wherein the paraffinic hydrocarbons are selected from ethane, propane, isopropane, and butane; and the alkylaromatic hydrocarbons are selected from ethylbenzene, propylbenzene and methylethylbenzene.

7. A process of claim 1 wherein the dehydrogenation reactor is a riser reactor.

8. A process of claim 1 wherein the hydrocarbon is introduced to the dehydrogenation reactor at multiple points of entry.

9. A process of claim 8 wherein both a paraffinic hydrocarbon and alkylaromatic hydrocarbon are introduced into the same dehydrogenation reactor with the paraffinic hydrocarbon being introduced at a relatively lower point of entry than the alkylaromatic hydrocarbon.

10. A process of claim 1 wherein the temperature within the dehydrogenation reactor is from about 500 to about 800°C, and the pressure is from about 3.7 to about 64.7 psia.

11. A process of claim 10 wherein the pressure is from about 3.7 to about 14.7 psia.

12. A process of claim 10 wherein the temperature is from about 570 to about 750°C.

13. A process of claim 3 wherein catalyst from the separation device is transferred to one of: a catalyst regenerator wherein the catalyst is regenerated and returned to the dehydrogenation reactor, and a recycle loop wherein catalyst is recycled from the separation device back to the dehydrogenation reactor.

14. A process of claim 13 wherein the catalyst from the recycle loop and regenerator are combined and introduced into the dehydrogenation reactor.

15. The process of claim 1 wherein the dehydrogenation catalyst is comprises gallium carried by an alumina or alumina silica support.

16. The process of claim 15 wherein the catalyst comprises a comprises an alkali or alkaline earth metal selected from at least one of: sodium, lithium, potassium, rubidium, magnesium, calcium, strontium and barium, and further comprises promoter selected from at least one of: manganese and platinum.

17. A process for dehydrogenating a hydrocarbon selected from at least one of:

i) paraffinic hydrocarbons selected from ethane, propane, and butane; and

ii) alkylaromatic hydrocarbons are selected from ethylbenzene, propylbenzene and methylethylbenzene; comprising

contacting a gaseous stream containing at least one of the hydrocarbons with a dehydrogenation catalyst comprising gallium carried by an alumina or alumina silica support, at reaction temperature and in concurrent flow through a dehydrogenation reactor wherein the average contact time between the hydrocarbon and catalyst within the dehydrogenation reactor is from about 1 to about 4 seconds; the catalyst has a average residence time within the dehydrogenation reactor from about 1 to about 10 seconds; and the temperature and pressure in the dehydrogenation reactor is from about 570 to about 750°C, and from about 6.0 to about 44.7 psia; and

transferring the hydrocarbon and catalyst from the dehydrogenation reactor to a separation device wherein the average contact time between the hydrocarbon and catalyst while at reaction temperature in the separation device is less than about 3 seconds and the total average contact time between the hydrocarbon, catalyst and resulting hydrocarbons while at reaction temperature is less than about 7 seconds.

18. An integrated process for making a vinyl aromatic compound comprising:

dehydrogenating a paraffinic hydrocarbon and an alkylaromatic hydrocarbon with a dehydrogenation catalyst at reaction temperature and in concurrent flow through a dehydrogenation reactor wherein the average contact time between the hydrocarbon and catalyst within the dehydrogenation reactor is from about 0.5 to about 10 seconds;

transferring the hydrocarbon and catalyst from the dehydrogenation reactor to a separation device and separating the catalyst from the resulting hydrocarbon wherein the average contact time between the hydrocarbon and catalyst while at reaction temperature in the separation device is less than about 10 seconds;

recovering vinyl aromatic hydrocarbons resulting from the dehydrogenation;

combining olefins resulting from dehydrogenation of paraffinic hydrocarbons with aromatic hydrocarbons in an alkylation reactor under conditions to produce alkylaromatic hydrocarbons;

transferring the alkylaromatic hydrocarbons from the alkylation reactor to the dehydrogenation reactor to produce vinyl aromatic compounds.

19. A process according to claim 18 wherein the dehydrogenation of the paraffinic hydrocarbon and alkylaromatic hydrocarbon is conducted concurrently in the same dehydrogenation reactor.

20. A process according to claim 19 wherein the dehydrogenation of the paraffinic hydrocarbon and alkylaromatic hydrocarbon are conducted in separate dehydrogenation reactors.